ATTACHMENT B

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-4. (canceled)

5. (currently amended) A reciprocating engine ~~as claimed in Claim 4~~ operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the EGR bypass has a gas cooler adjustable to cool the transferred flow of the hot exhaust gas down to a temperature close to that of fresh air, and

wherein the adjustment of the temperature is effected by controlling a bypass of the cooler.

6. (currently amended) A method of ~~supplying~~ operating a reciprocating engine ~~as claimed in Claim 4,~~ wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the EGR bypass has a gas cooler adjustable to cool the transferred flow of the hot exhaust gas down to a temperature close to that of fresh air, and

wherein the method of operating includes controlling the EGR bypass temperature ~~is controlled~~ to create ~~the~~ a desired excess of air for ~~the~~ combustion in the engine.

7. (currently amended) A method of ~~supplying~~ operating a reciprocating engine ~~as claimed in Claim 4,~~ wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and

wherein the EGR bypass has a gas cooler adjustable to cool the transferred flow of the hot exhaust gas down to a temperature close to that of fresh air; and

wherein the method of operating includes controlling the EGR bypass temperature ~~is controlled~~ so that a mass of the transferred hot exhaust ~~recycled~~ gases remains substantially equal to a mass of the fresh air up to the speed at which this temperature returns to the exhaust temperature, the ~~recycled~~ mass of the transferred hot exhaust gas becoming greater than the mass of the fresh air above this speed.

8. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 5, wherein the gas cooler is totally bypassed when the engine does not deliver propulsive power.

9. (currently amended) A method of ~~supplying~~ operating a reciprocating engine as claimed in Claim 8, wherein for cold starting and operating at idling speed, an adjustment of turbine valves and/or a timing of engine valves is adjusted so that the excess of combustion air is minimal for a desired level of depollution.

10. (canceled)

11. (currently amended) A reciprocating engine as claimed in ~~Claim 4,~~ Claim 7,

wherein~~:~~ the adaptation speed Na is substantially equal to Nmin/2 so that the volume of the transferred flow of the hot exhaust ~~recycled~~ gases is at least equal to that of the fresh air, and

wherein the minimum temperature of the transferred flow of the hot exhaust ~~recycled~~ gases is close to the temperature of the fresh air so that a mass of the transferred flow of the hot exhaust ~~recycled~~ gases is at least equal to that of the fresh air at the minimum speed used Nmin in order to depollute ~~during all ranges of use of~~ down to the ~~engine~~ minimum speed Nmin.

12. (currently amended) A reciprocating engine ~~as claimed in Claim 1,~~ operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the turbocharging unit has a low-pressure LP turbocharger and a high-pressure HP turbocharger, compressors of which work in series with an exhaust outlet section Sd which is adjustable between a minimum Sd min and a maximum Sd max by one or a combination of the following:

- adjustment of a variable section of a gas distributor of the turbochargers ~~turbines~~,
- opening of a bypass between an inlet and an outlet of the turbochargers ~~turbines~~, and
- passage from a series configuration to a parallel configuration of the turbochargers ~~turbines~~,

the turbocharging adaptation speed Na thus being adjustable, in a continuous or discontinuous manner, between two values Na min and Na max.

13. (currently amended) A reciprocating engine as claimed in Claim 12, wherein the minimum exhaust outlet section Sd min offered to the gases is formed by the two turbochargers ~~turbines~~ mounted in series at maximum closure.

14. (previously presented) A reciprocating engine as claimed in Claim 13, which operates on a 4-stroke cycle with a fixed timing of associated valves.

15. (currently amended) A reciprocating engine as claimed in Claim 12, ~~14,~~

wherein the maximum exhaust outlet section Sd max offered to the gases is formed by the two turbochargers ~~turbines~~ which have fixed distributors mounted in parallel, and

wherein, in order to pass the turbochargers ~~turbines~~ from the series configuration to the parallel configuration, the following manoeuvres are carried out successively:

- progressive partial opening of an HP waste gate between the inlet and the outlet of ~~a~~ the HP turbocharger ~~turbine~~,

- progressive and simultaneous partial opening of the HP waste gate and an LP waste gate~~s~~, between the inlet and the outlet of the LP turbocharger, and

- simultaneously and rapidly: total opening of the HP waste gate, total closure of the LP waste gate, and putting the outlet of the HP turbocharger ~~turbine~~ into communication with the outlet of the LP turbocharger ~~turbine~~.

16. (currently amended) A reciprocating engine as claimed in Claim 14,

wherein the maximum outlet section Sd max offered to the gases is formed by ~~a~~ the LP turbocharger ~~turbine~~ with fixed distributor and ~~a~~ the HP turbochargers ~~turbine~~ with variable distributor mounted in parallel, the HP variable distributor being fully open, and

wherein, in order to pass the turbochargers ~~turbines~~ from the series configuration to the parallel configuration, the following manoeuvres ~~to be~~are carried out successively:

progressive opening of a distributor of the HP ~~turbine~~ turbocharger,

progressive partial opening of an LP waste gate,

simultaneously and rapidly: total opening of the LP waste gate and putting the outlet of the HP turbocharger ~~turbine~~ into communication with the outlet of the LP ~~turbine~~ turbocharger.

17. (currently amended) A method of ~~supplying~~ operating a reciprocating engine ~~as claimed in Claim 2,~~ wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and

wherein the EGR bypass has an EGR valve to increase the turbine inlet pressure above the compressor discharge pressure; and

wherein the method of operating includes, in order to limit a frequency of changing a configuration, immobilizing of the fixed geometry ~~is immobilized~~ for a type of driving which implements a limited power range, and power thresholds corresponding to each configuration are crossed for manoeuvres of short duration, and

wherein the method of operating further includes crossing of the power thresholds ~~may be crossed:~~ by closure of the EGR valve~~,~~.

~~- by opening of one or two waste gates,~~

~~- by closure of an intake valve.~~

18. (currently amended) A method of ~~supplying~~ operating a reciprocating engine ~~as claimed in Claim 3,~~ wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and

wherein the turbocharging unit comprises one or two waste gates, each an inlet and an outlet of a turbocharger; and

wherein the method of operating includes, in order to limit a frequency of changing a configuration, immobilizing of the fixed geometry ~~is immobilized~~ for a type of driving which implements a limited power range, and power thresholds corresponding to each configuration are crossed for manoeuvres of short duration, and

wherein the method of operating further includes crossing of the thresholds ~~may be crossed:~~

~~–by closure of an EGR valve,~~

–by opening of one or two waste gates~~,~~

~~–by closure of an intake valve~~.

19. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim ~~12~~ 18,

wherein, ~~in order~~ the EGR bypass has an EGR valve to ~~limit a frequency~~ increase the turbine inlet pressure above the compressor discharge pressure, and

includes crossing of ~~changing a configuration, the geometry is immobilized for a type of driving which implements a limited power range, and power~~ the thresholds ~~corresponding to each configuration are crossed for manoeuvres of short duration,~~ by closure of the EGR valve, and

~~wherein the thresholds may be crossed:~~

~~–by closure of the EGR valve,~~

–by opening of one or two of the waste gates~~,~~

~~–by closure of an intake valve~~.

20. (currently amended) A reciprocating engine as claimed in Claim 15, wherein the LP waste gate has a second seat in order simultaneously to effect a closure of the LP turbocharger ~~turbine~~ inlet/outlet bypass and putting the HP ~~turbine~~ turbocharger outlet into communication with the LP turbine outlet.

21. (previously presented) A reciprocating engine as claimed in Claim 15, wherein the two waste gates are concentric and have stops such that simultaneous movements thereof are actuated by one and communicated to the other by the stops.

22. (currently amended) A reciprocating engine as claimed in Claim ~~14,~~13 wherein the maximum exhaust outlet section Sd max is formed by two turbines with fully open variable distributors mounted in series, and wherein the distributors are opened simultaneously in order to maintain the intake pressure at a maximum desired value thereof on a full load curve.

23. (currently amended) A reciprocating engine as claimed in Claim 13,

wherein a timing of engine valves is controlled to displace a closure of an associated cylinder between the vicinity of the BDC and the mid-stroke of an associated piston,

wherein the maximum exhaust outlet section Sd is formed by the HP ~~turbine~~ turbocharger in series configuration; and

wherein the turbochargers ~~turbines~~ are dimensioned to permit the compressors thereof to reach maximum pressure ratios thereof simultaneously.

24. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 23, wherein a full load curve as a function of the speed is operated as follows:

from Nmin to 2 Nmin, an intake closure FA passes from the BDC to approximately 90 degrees of a crankshaft after the BDC to maintain a cycle pressure below a desired value thereof, and

a distributor or an HP waste gate is closed;

from 2 Nmin to approximately 3 Nmin, the HP distributor or the HP waste gate is open to maintain an intake pressure at a maximum desired value thereof, and

the intake closure FA is maintained at 90 degrees of the crankshaft after the BDC; and

from 3 Nmin to Nmax, a global flow rate of fuel is kept constant to maintain the intake pressure at a limiting value thereof, and

at partial load, a timing of intake closure FA is controlled according to a map stored in an engine control computer.

25. (currently amended) A reciprocating engine as claimed in Claim 13, which operates on the 2-stroke cycle, and wherein:

intake ports are closed by engine valves,

exhaust ports are closed by engine valves and communicate with one single exhaust manifold,

an external recycling phase precedes scavenging,

a timing of the engine valves is controlled to displace a closure of an associated cylinder between the vicinity of the BDC and the mid-stroke of an associated piston,

a maximum exhaust outlet section Sd is formed by the HP ~~turbine~~ turbocharger in series configuration,

the turbochargers ~~turbines~~ are dimensioned to permit associated compressors to reach maximum pressure ratios thereof simultaneously, and

the EGR bypass is one of a check valve or a closable aerodynamic diode.

26. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 25,

wherein a full load curve as a function of speed is operated as follows:

- from Nmin to 2 Nmin, the closure of the cylinder passes from the BDC to approximately 90 degrees of the crankshaft after the BDC to maintain cycle pressure at a desired value thereof,
- a distributor or an HP waste gate is closed,
- from 2 Nmin to approximately 3 Nmin, the HP distributor or the HP waste gate is open to maintain an intake pressure at a maximum desired value thereof,
- an intake closure FA is maintained at 90 degrees of the crankshaft after the BDC,
- from 3 Nmin to Nmax, a global flow rate of fuel is kept constant to maintain the intake pressure at a limiting value thereof; and

wherein, in order to maximize cooled external EGR, depolluted partial loads are effected as follows:

- the cylinder remains closed in the vicinity of the BDC and the turbochargers ~~turbines~~ remain in closed configuration up to the compressor discharge pressure limit for this timing,
- the turbochargers ~~turbines~~ are then opened in order to maintain the compressor discharge pressure at a limiting value thereof, and
- the aerodynamic diode is used when the external recycling flow stops.

27. (currently amended) A reciprocating engine as claimed in Claim 13, which operates on the 2-stroke cycle,

wherein there are two exhaust ports per cylinder, closed by engine valves, which communicate respectively with an exhaust manifold connected to the turbocharger ~~turbine~~ and an exhaust manifold connected to the EGR bypass and/or to the turbocharger ~~turbine~~ via a controlled distributor valve,

wherein timing of the engine valve assigned to the EGR bypass is controlled to displace the closure of the cylinder between the vicinity of the BDC and the mid-stroke of an associated piston, wherein:

an external recycling phase precedes the scavenging when the cylinder closes in the vicinity of the BDC and follows the scavenging when the cylinder closes at the mid-stroke of the piston;

the maximum outlet section Sd is formed by the HP turbocharger ~~turbine~~ in series configuration ;

the turbochargers ~~turbines~~ are dimensioned to permit the compressors to reach maximum pressure ratios thereof simultaneously; and

the EGR bypass is one of a check valve or a closable aerodynamic diode.

28. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 27, wherein:

the compressor discharge pressure is lower than a limit allowed for the timing,

the distributor valve is in a recycling position,

the cylinder is closed in the vicinity of the BDC,

a distributor or an HP waste gate is closed,

when the pressure reaches the limiting value allowed for this timing, the closure of the cylinder is displaced to the mid-stroke of the piston in order substantially to double the allowed compressor discharge pressure limit,

the distributor valve remains in the recycling position,

the distributor or the HP waste gate remains closed,

the compressor discharge pressure reaches a new limit allowed for this new timing,

the distributor valve blocks the recycling,

the distributor or the HP waste gate opens in order to keep the compressor discharge pressure at a new allowed limit thereof, and

the transition is made by one of progressively in the two directions or rapidly with a hysteresis.

29. (currently amended) A method of <u>operating</u> ~~supplying~~ a reciprocating engine as claimed in Claim 6, wherein:

at full load the ~~variable~~ <u>fixed</u> geometry is <u>selectively variable and is</u> controlled to maintain a parameter at a limiting desired value thereof; <u>and</u>

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

30. (currently amended) A method of <u>operating</u> ~~supplying~~ a reciprocating engine as claimed in Claim 7, wherein:

at full load the <u>fixed</u> ~~variable~~ geometry <u>is selectively variable and</u> is controlled to maintain a parameter at a limiting desired value thereof; <u>and</u>

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

31. (currently amended) A method of <u>operating</u> ~~supplying~~ a reciprocating engine as claimed in Claim 8, wherein:

at full load the <u>fixed</u> ~~variable~~ geometry <u>is selectively variable and</u> is controlled to maintain a parameter at a limiting desired value thereof; <u>and</u>

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

32. (currently amended) A method of <u>operating</u> ~~supplying~~ a reciprocating engine as claimed in Claim 9, wherein:

at full load the <u>fixed</u> ~~variable~~ geometry <u>is selectively variable and</u> is controlled to maintain a parameter at a limiting desired value thereof; <u>and</u>

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

33. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 17, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

34. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 18, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled so as to optimize depollution and/or performance according to a map stored in an engine control computer.

35. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 19, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

36. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 24, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

37. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 26, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

38. (currently amended) A method of operating ~~supplying~~ a reciprocating engine as claimed in Claim 28, wherein:

at full load the fixed ~~variable~~ geometry is selectively variable and is controlled to maintain a parameter at a limiting desired value thereof; and

at partial load the variable geometry is controlled to optimize depollution and/or performance according to a map stored in an engine control computer.

39. (currently amended) A reciprocating engine ~~as claimed in Claim 1,~~ operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass; and

further including a flat cylinder head bearing valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein an intake pipe or pipes terminate(s) at an oblong nozzle defined by an upper half-cylinder resting on an upper edge of a conical seat and tangent to ~~this~~ said seat along a generating line thereof situated in a plane substantially perpendicular to a plane passing through ~~the~~ an axis of the seat and through an axis of the cylinder and through a lower cylinder covering half of a valve head opposite the generating line,

wherein the nozzles are also oriented to create a tangential speed in a same direction, and

wherein angles of the seats are chosen to optimize stratification of a combustive charge.

40. (currently amended) A reciprocating engine ~~as claimed in Claim 1,~~ operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass;

further including a flat cylinder head bearing valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein a conical sealing bearing surface of intake valves is extended towards a piston by a cylindrical part having a height slightly greater than a lift of the valves,

wherein the conical sealing bearing surfaces of the valves are disposed at a bottom of cylindrical recesses provided in a cylinder head in order to receive cylindrical parts of the valves such that flat lower faces of the valves are in a plane of the cylinder head when the lower faces rest on the associated seats thereof, a clearance between the recesses and the valves being minimal, and

wherein the recesses are provided in the cylinder head and do not go beyond the following boundaries:

- two cylindrical portions concentric with a bore and tangent externally and internally to the cylindrical recess of each valve, and

- a conical surface extending a half-seat of the valve delimited by a plane passing through an axis thereof and an axis of the cylinder;

wherein the recesses are also oriented to create a tangential velocity in a same direction, and

wherein an angle of the seats is chosen to optimize a stratification of a combustive charge.

41. (previously presented) A reciprocating engine as Claimed in Claim 39, including two diametrically opposed intake valves.

42. (previously presented) A reciprocating engine as Claimed in Claim 40, including two diametrically opposed intake valves.

43. (currently amended) A reciprocating engine ~~as claimed in Claim 1,~~ operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit which:

- supplies an intake manifold of the engine with compressed air via a cooler;
- is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and
- has a turbine inlet pressure substantially equal to a compressor discharge pressure;

wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,

wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,

wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,

such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass; and

wherein:

a fraction of the ~~recycled~~ transferred hot exhaust gas~~es~~ is retained in a cylinder at a closure of the cylinder,

the ~~fresh gases are~~compressed air is introduced by directive intake conduits to create a stratification of temperatures and concentrations in a chamber at the combustion top dead centre, and

a fuel is vaporized in the ~~fresh gases~~compressed air.

44. (currently amended) A reciprocating engine as claimed in Claim 43, wherein the fuel is introduced into the ~~fresh~~ compressed air between the compressor and an external EGR mixer.

45. (currently amended) A reciprocating engine as claimed in Claim 43, wherein the fuel is introduced into a mixture between the compressed ~~pure~~ air and an external EGR.

46. (previously presented) A reciprocating engine as claimed in Claim 43, wherein an ignition point is controlled by a timing of valves at the closure of the cylinder.

47. (previously presented) A reciprocating engine as claimed in Claim 43, wherein an ignition point is controlled by a temperature of an external EGR.

48. (previously presented) A reciprocating engine as claimed in Claim 43, wherein a first ignition is controlled electrically or is triggered spontaneously by an injection of the fuel at high pressure at the top dead centre.

49. (previously presented) A reciprocating engine as claimed in Claim 43, wherein:

a working chamber of the gases has a geometry revolving around an axis of the cylinder;

the stratification has a geometry revolving around the axis of the cylinder and created by an orientation of intake ports, and

the temperature of a combustive charge increases between a periphery and the axis so that a self-ignition is propagated from a centre towards a periphery.

50. (previously presented) A reciprocating engine as claimed in Claim 49, wherein a meridian profile of the combustion chamber is chosen to optimize a rate of release of energy by a progressiveness of isothermal surfaces of a reactive load.

51. (canceled)

52. (new) A reciprocating engine as in claim 15, wherein the section of the HP waste gate fully opened is smaller than the section of the LP turbocharger to increase the gas flow through the HP turbocharger in the parallel configuration.

53. (new) A reciprocating engine including a flat cylinder head bearing valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein an intake pipe or pipes terminate(s) at an oblong nozzle defined by an upper half-cylinder resting on an upper edge of a conical seat and tangent to said seat along a generating line thereof situated in a plane substantially perpendicular to a plane passing through an axis of the seat and through an axis of the cylinder and through a lower cylinder covering half of a valve head opposite the generating line,

wherein the nozzles are also oriented to create a tangential speed in a same direction, and

wherein angles of the seats are chosen to optimize stratification of a combustive charge.

54. (new) A reciprocating engine including a flat cylinder head bearing valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein a conical sealing bearing surface of intake valves is extended towards a piston by a cylindrical part having a height slightly greater than a lift of the valves,

wherein the conical sealing bearing surfaces of the valves are disposed at a bottom of cylindrical recesses provided in a cylinder head in order to receive cylindrical parts of the valves such that flat lower faces of the valves are in a plane of the cylinder head when the lower faces rest on the associated seats thereof, a clearance between the recesses and the valves being minimal, and

wherein the recesses are provided in the cylinder head and do not go beyond the following boundaries:

- two cylindrical portions concentric with a bore and tangent externally and internally to the cylindrical recess of each valve, and

- a conical surface extending a half-seat of the valve delimited by a plane passing through an axis thereof and an axis of the cylinder;

wherein the recesses are also oriented to create a tangential velocity in a same direction, and

wherein an angle of the seats is chosen to optimize a stratification of a combustive charge.

55. (new) A method of operating a reciprocating engine wherein:

a fraction of the hot exhaust gas is retained in a cylinder at a closure of the cylinder,

compressed air is introduced by directive intake conduits to create a stratification of temperatures and concentrations in a chamber at the combustion top dead centre, and

a fuel is vaporized in the compressed air.